

What is claimed is:

1. A composite textile article which comprises:

- 5 a) a sheet of a central textile fabric having a front side and a rear side; said sheet of central textile fabric being water vapor permeable, and which sheet of central textile fabric comprises a plurality of fibers having semi-opened micro-cavities; and which fibers have been impregnated with at least one biological and/or chemical decontamination reagent in an amount sufficient to
- 10 chemically modify, neutralize and/or decontaminate chemical and/or biological contaminants;
- b) a pair of sheets of outer textile fabrics, one of the sheets of outer textile fabrics positioned on the front side of the sheet of central textile fabric and the other sheet of outer textile fabric positioned on the rear side of the sheet of
- 15 central textile fabric; each sheet of outer textile fabric being water vapor permeable;
- c) the sheet of central textile fabric and the pair of sheets of outer textile fabrics being attached together via a sealed hem around a perimeter of the sheet of central textile fabric and the pair of sheets of outer textile fabrics,
- 20 which hem is sealed such that it prevents the at least one biological and/or chemical decontamination reagent from passing through the hem.

2. The composite textile article of claim 1 wherein the fibers comprise polymeric multilobal fibers have a central core having a plurality of T-shaped

25 lobes projecting therefrom, each of said T-shaped lobes having a leg and a cap, said lobes defining a longitudinally extending internal cavity between two adjacent legs that extends the entire length of the fiber.

3. The composite textile article of claim 1 wherein additionally the sheet of central textile fabric has been impregnated between the fibers with at least one biological and/or chemical decontamination reagent.

5 4. The composite textile article of claim 1 wherein at least one of the sheets of outer textile fabrics comprises a plurality of fibers having semi-opened micro-cavities; and which fibers have been impregnated with at least one biological and/or chemical decontamination reagent.

10 5. The composite textile article of claim 4 wherein at least one of the sheets of outer textile fabrics has been impregnated between the fibers with at least one biological and/or chemical decontamination reagent.

15 6. The composite textile article of claim 1 wherein at least one sheet of outer textile fabric is liquid impermeable.

7. The composite textile article of claim 1 wherein at least one sheet of outer textile fabric is liquid permeable.

20 8. The composite textile article of claim 1 wherein each sheet of outer textile fabric is liquid impermeable.

9. The composite textile article of claim 1 wherein the sheet of central textile fabric is liquid impermeable.

25 10. The composite textile article of claim 1 wherein each sheet of outer textile fabric is liquid impermeable and the sheet of central textile fabric is liquid impermeable.

11. The composite textile article of claim 1 wherein said central textile fabric has been impregnated with a liquid biological and/or chemical decontamination reagent.

5 12. The composite textile article of claim 1 wherein said central textile fabric has been impregnated with biological and/or chemical decontamination reagent powder particles.

10 13. The composite textile article of claim 12 wherein the biological and/or chemical decontamination reagent powder particles have been infused between said fibers and in said cavities, said powder particles being of such a size and shape that they are retained within each cavity.

15 14. The composite textile article of claim 12 wherein the biological and/or chemical decontamination reagent powder particles range in size from about 1 micron to about 10 microns.

20 15. The composite textile article of claim 1 wherein the biological and/or chemical decontamination reagent comprises one or more materials selected from the group consisting of acids, bases, adsorbents, activated carbon, zeolites, alumina, silica, deliquescent agents such as lithium chloride, organometallic catalysts, enzymes with regenerable cofactors such as butyrylcholinesterase, oxidizing agents, detergents, surfactants, quaternary ammonium complexes, photochemical agents, and solvents.

25 16. The composite textile article of claim 1 wherein the biological and/or chemical decontamination reagent comprises one or more materials selected from the group consisting of sodium hydroxide, potassium hydroxide, ammonium hydroxide; ammonia compounds, sodium phosphate;
30 polymethioine, cyanogen bromide, immobilized acetylcholinesterase on

- alumina or silica, copper/cobalt, nucleophilic oximes, lithium chloride, butyrylcholinesterase, cyanide carbonyls, carbonimides, substituted phosphoric acid, esters, thioethers, nitrogen heterocycles, olefinics, peroxides, peracetates, perborates, sodium permanganate, potassium permanganate,
- 5 calcium hypochlorite, calcium oxide, benzyltrimethyl ammonium chloride, ethyl ammonium chloride, zinc chloride, iron sulfate, sulfuric acid, phosphoric acid, titanium dioxide, water, alcohols, phenol, ethanol, diethylenetriamine, and ethylene glycol monomethyl ether.
- 10 17. An garment which comprises the composite textile article of claim 1.
18. A head covering which comprises the composite textile article of claim 1.
19. A garment which comprises a flexible fabric material in a shape
- 15 configured to contain all or part of a human body; a cutout through the flexible fabric material; and a panel removably attached around a periphery of the cutout; which panel comprises the composite textile article of claim 1.
- 20 20. The garment of claim 19 wherein the panel is removably attached around a periphery of the cutout by a hook and burr fastener.
21. A method of producing a composite textile article which comprises:
- a) providing a sheet of a central textile fabric having a front side and a rear side; said sheet of central textile fabric being water vapor permeable, and
- 25 which sheet of central textile fabric comprises a plurality of fibers having semi-opened micro-cavities; and which fibers have been impregnated with at least one biological and/or chemical decontamination reagent in an amount sufficient to chemically modify, neutralize and/or decontaminate chemical and/or biological contaminants;

b) providing a pair of sheets of outer textile fabrics, one of the sheets of outer textile fabrics positioned on the front side of the sheet of central textile fabric and the other sheet of outer textile fabric positioned on the rear side of the sheet of central textile fabric; each sheet of outer textile fabric being water vapor permeable;

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c) attaching the sheet of central textile fabric and the pair of sheets of outer textile fabrics being attached together via a sealed hem around a perimeter of the sheet of central textile fabric and the pair of sheets of outer textile fabrics, which hem is sealed such that it prevents the at least one biological and/or

10 chemical decontamination reagent from passing through the hem.

22. The method of claim 21 wherein the fibers comprise polymeric multilobal fibers have a central core having a plurality of T-shaped lobes projecting therefrom, each of said T-shaped lobes having a leg and a cap, said lobes

15 defining a longitudinally extending internal cavity between two adjacent legs that extends the entire length of the fiber.

23. The method of claim 21 wherein additionally the sheet of central textile fabric has been impregnated between the fibers with at least one biological

20 and/or chemical decontamination reagent.

24. The method of claim 21 wherein at least one of the sheets of outer textile fabrics comprises a plurality of fibers having semi-opened micro-cavities; and which fibers have been impregnated with at least one biological and/or

25 chemical decontamination reagent.

25. The composite textile article of claim method of claim 24 wherein at least one of the sheets of outer textile fabrics has been impregnated between the fibers with at least one biological and/or chemical decontamination reagent.

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26. The method of claim 21 wherein at least one sheet of outer textile fabric is liquid impermeable.

27. The method of claim 21 wherein at least one sheet of outer textile fabric is liquid permeable.

28. The method of claim 21 wherein each sheet of outer textile fabric is liquid impermeable.

29. The method of claim 21 wherein the sheet of central textile fabric is liquid impermeable.

30. The method of claim 21 wherein each sheet of outer textile fabric is liquid impermeable and the sheet of central textile fabric is liquid impermeable.

31. A method which comprises providing the composite textile article of claim 1 and then forming the composite textile article into a garment in a shape configured to contain all or part of a human body.

32. A method which comprises providing a garment in a shape configured to contain all or part of a human body, which garment comprises composite textile article of claim 1, and then passing a breathable atmosphere through the composite textile article to thereby chemically modify, neutralize and/or decontaminate chemical and/or biological contaminants from the breathable atmosphere.

33. A method which comprises providing a garment comprising a flexible fabric in a shape configured to contain all or part of a human body, and having a cutout through the flexible fabric material; providing a panel which

comprises the composite textile article of claim 1 and removably attaching the panel around a periphery of the cutout.

34. The method of claim 33 wherein the panel is removably attached around a
5 periphery of the cutout by a hook and burr fastener.